

Neurological examination

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Neurological examination

most important cases in exam:-

- 1- UMNL.
- 2- LMNL.
- 3- Mixed.
- 4- cerebellar ataxia.
- 5- cranial nerve lesion.

Neurology

A-central nervous system:-

- 1-brain [2 cerebral hemispheres]
- 2-brain stem:-midbrain, pons, medulla.
- 3-cerebellum
- 4-basal ganglia[caudate, putamen, Globus pallidus, substantia nigra]
- 5-spinal cord

B-peripheral nervous system:-

- 1-nerves & nerve roots.
- 2-ganglia.

Upper motor neuron UMN ⇒ Pyramidal tract.	Lower motor neuron LMN ⇒ peripheral nerves.
Its nerves coming from motor area in cerebral cortex to AHC of spinal cord or to nucleus of brain stem.	its nerves emerge from the neuron located in spinal cord or nucleus of brain stem to the muscles.
Divided in to: - 1- corticospinal tract: - tract from cerebral cortex to spinal cord ⇒ cross to opposite side in lower medulla. 2- cortico-bulbar tract: - tract from cortex to brain stem. Crossed to opposite side in midbrain, pons, and upper medulla.	divided in to:- 1- spinal nerves:- from spinal cord. 2- cranial nerves:- from brain stem.

function of UMN

- 1** -movement of muscles (power)
- 2** -control of LMN & gives order.
- 3** -inhibits tone & reflex which generated from lower motor neuron

function of LMN

- 1** - movement of muscles (power)
- 2** - Generation of intrinsic discharge activity going to muscles direct without order of UMN resulting in muscle tone .
- 3** - Reflex present between LMN supplying the muscle and sensory fiber coming from stretch receptor found in tendon of same muscle.

Differences between UMN & LMN

examination	UMN	LMN
wasting	no or slight	marked wasting
fasciculation	no	yes
tone	spastic tone	decreased tone
power (weakness)	decrease power in pyramidal distribution	decrease power in segmental distribution
reflex deep	hyperreflexia	hyporeflexia or absent reflex.
Superficial reflex	+ve Babinski +ve Hoffman	absent superficial reflex.
clonus	+ve test	-ve test

Motor system examination

The aim of motor examination is to decide whether the lesion is upper motor or lower motor neuron lesion.

A-inspection:-

Don't touch the PT and don't change the first position of his limbs then look for:- (posture, abnormal movement, wasting, fasciculations, scar)

*What abnormal movement do you know?

Tremor: -it's rhythmic oscillation of a part of body, usually distal limbs.

Types of tremor:-

- 1. Resting =static tremor:-** occur in Parkinson's diseases of basal ganglia which responsible for control between agonist & antagonist muscle during rest .
- 2. Intentional tremor = kinetic tremor:-** occur during movement in cerebellar diseases [cerebellum is responsible for coordination between agonists and antagonists during movement.
- 3. postural tremor:-** occur when a part of the body fixed in position against gravity & the causes include:-

- Familial tremor
- Increase sympathetic:-

1 -anxiety.

2 -thyrotoxicosis.

3 -drugs [salbutamol].

- 4. Asterixis =flapping tremor:-** wrist fixed in dorsiflexion with stretched arms ⇒ tremor appears after about 15sec.

causes:- **1** - liver, renal, respiratory (failure).

2 -drug (phenytoin).

3 -acute partial or thalamic lesion.

Chorea: - rapid purposeless jerky movement & occurs in disease of basal ganglia (in voluntary movement).

Causes as:- **1** - rheumatic fever
2 -wilson's disease.

B-palpation:- temperature, tenderness, muscle bulks.

C-Tone: - its resistant against passive movement of joint or its contraction of muscles during rest.

Make sure PT is pain free & relaxed :-

Upper limbs		Lower limbs	
Shoulder	Abduct & adduct passively	hip	flex and extend passively
elbow	Flex & extend passively	knee	flex and extend passively
wrist	Flex & extend passively	ankle	Dorsiflexion & planter flexion
N.B:- shaking method can be used to assessment the tone for both L.L and U.L			

Comments about tone wither Hypotonia (flaccid ⇒ LMNL), hypertonia ⇒ UMNL, or normal tone.

✱ **N.B:-** Hypertonia presents in 2 forms:-

1 - Spasticity: - increase of resistant is present and sudden disappear at end of joint movement

Which occur in pyramidal tract lesion e.g. Clasp-knife spasticity.

2- Rigidity: - increase of resistant is present all over the joint movement.

Which occur in extrapyramidal tract lesion (basal ganglia) E.g. lead-pipe rigidity & cogwheel rigidity (cogwheel= rigidity +tremor).

N.B:- the extra pyramidal tract [basal ganglia] ⇒has inhibitory effect on the muscle tone. so when damaged lead to hypertonia but in from of rigidity not spasticity like pyramidal tract lesion.

D-Power: - MRC medical research council scale:-

Grade (0) no movement or contraction.

Grade (1) contraction without movement.

Grade (2) movement with gravity.

Grade (3) movement against gravity.

Grade (4) movement against partial power.

Grade (5) movement against complete power [full power]⇒ normal.

✱ **For upper limbs:-**

Ask PT to elevate both U.L actively if he do, that means the power grade 3 or more then test the following movement against resistant to determined grade (4 or 5) .

◦ **Shoulder Abduction**⇒ deltoid muscle ⇒C5.

◦ **Shoulder Adduction**⇒ pectoral muscles⇒C6-8.

◦ **Elbow flexion**⇒ biceps⇒ C5.

◦ **Elbow extension**⇒triceps⇒C6.

◦ **Wrist flexion**⇒ flexor carpi radialis & ulnaris⇒C6-8

◦ **Wrist extension**⇒extensor carpi radialis & ulnaris⇒C7

◦ **Hand grip**⇒ short flexors of the fingers⇒C8.

*For lower limbs:-

Ask PT to elevate each **L.L** alone actively if he do, that means the power grade 3 or more then test the following movement against resistant to determined grade (4 or 5).

- Hip flexion⇒ iliopsoas⇒ L1,L2.
- Hip extension⇒ gluteus Maximus ⇒ L4, L5.
- Hip abduction⇒ gluteus medius & minimus ⇒L4,L5.
- Hip adduction⇒ adductors of the thigh⇒ L2-4.
- Knee flexion⇒ hamstrings⇒ L5, S 1.
- Knee extension⇒ quadriceps⇒L3, L4.
- Ankle dorsiflexion⇒ tibialis anterior and long extensors⇒ L4, L5.
- Ankle plantar flexion⇒ gastrocnemius⇒S 1.

E-Reflexes:-

Superficial reflexes:-

- 1- Babinski sign(planter reflex)⇒ L5-S2 ⇒if +ve means **abnormal**
- 2- Hoffman sign⇒if +ve means **abnormal**
- 3- Abdominal reflex⇒ **T9-T12**⇒+ve normal present.
- 4- Cremastic reflex ⇒**L1-L2** ⇒+ve normal present.
- 5- Anal reflex⇒ **S2,S3, S4** ⇒ +ve normal present.

N.B:-the only Babinski & Hoffman if +ve mean's abnormal.

Deep reflexes:-

Upper limbs	Lower limbs
1- biceps⇒ C5,C6	ankle⇒ S1.S2
1- triceps⇒ C5,C6	1- knee.⇒ L3.L4
brachioradialis⇒ C7,C8	If there is sign of UMNL you have to do planter reflex, ankle clonus ,patellar clonus
If there is sign of UMNL you have to look for Hoffman sign.	

N.B:- No change occurs in reflex in extra pyramidal tract lesion (Parkinsonism).

Other reflexes: - **1** - clonus: - it's abnormal if sustained for more than 3 twitches.

2 - Wartenberg's: - in finger.

N.B:- don't say absent reflex until you do reinforcement.

Cerebellum (Coordination) examination:-

Coordination between agonist and antagonist muscle done by the basal ganglia during rest if damaged ⇒ (static tremors) , and by the cerebellum during active movement if damaged ⇒ (kinetic tremor)

N.B:- this step of examination its part of motor system examination.

 **Signs of cerebellar diseases:-** Loss of coordination

• **Face** ⇒ (eyes, mouth) Nystagmus ⇒ horizontal, Speech is scanning ⇒ dysarthria .

• **In the upper limbs** ⇒ • finger to nose tests (intentional tremor, dysmetria).
• Alternating hand movements (Dysdiadochokinesia).
• Rebound phenomena

• **In the lower limbs** ⇒ • heel to shine test.
• Heel-toe test ⇒ walk on strait line (tandem gait)
• Gait ataxia (wide based gait) patient tends to fall towards the side of the lesion.
• Romberg's test (+ve in sensory ataxia)

• **Other sign:** - Hypotonia, absent reflexes.

 **N.B:-** if examiner asks you where site of lesion?

Answer: - should examine both upper limbs if you examine lower limbs only and vies -versa.

Site of lesion	Localizing according to the level
Cerebral cortex & internal capsule	• UMNL hemiplegic distribution
Above C5	• Bilateral umnl +sensory loss in all limbs • If C3,C4,C5 all involved bilaterally ⇒ death
C5 to T1 (brachial plexus)	• LMNL +sensory loss in upper limbs • Bilateral umnl in legs
T2 to T12/L1	• Bilateral umnl in legs • Sensory level on trunk 1- t8-t9 ⇒ above umbilicus • T10 ⇒ at umbilicus • T11-t12 ⇒ below umbilicus
Below L1 (lumbosacral plexus) ⇒ cauda-equina	• LMNL in lower limbs
N.B:- At any site the bladder and bowel control may lost .	

Causes of UMNL	Causes of LMNL
1- CVA	1- Trauma
2- Multiple sclerosis	2- ALS
3- Space occupying lesion(tumor)	3- Poliomyelitis
4- Vasculitis	4- Spinal artery thrombosis
5- Trauma-→Subdural hematoma	
6- Brain abscess	

Mixed lesion (UMNL & LMNL)

The finding of an extensor plantar response(Babinski sign) with an absent ankle reflex suggests a mixed UMN and LMN lesion.

- 1.** Vitamin **B₁₂** deficiency subacute combined degeneration.
- 2.** Friedreich's Ataxia.
- 3.** Diabetic amyotrophy
- 4.** Others: Syringomelia, Amyotrophic lateral sclerosis, cervical myelopathy, and tabes dorsalis.

Causes of spastic paraparesis or paraplegia

- 1-** Trauma.
- 2-** Multiple sclerosis.
- 3-** HIV.
- 4-** Spinal cord tumor.

Cranial nerves examination:-

•The nuclei of the cranial nerves:-

- I** and **II**⇒ nuclei are located in the brain.
- III** and **IV**⇒nuclei are located in the midbrain.
- V, VI, VII** and **VIII**⇒ nuclei are located in the pons.
- XI, X, XI,** and **XII**⇒nuclei are located in the medulla.

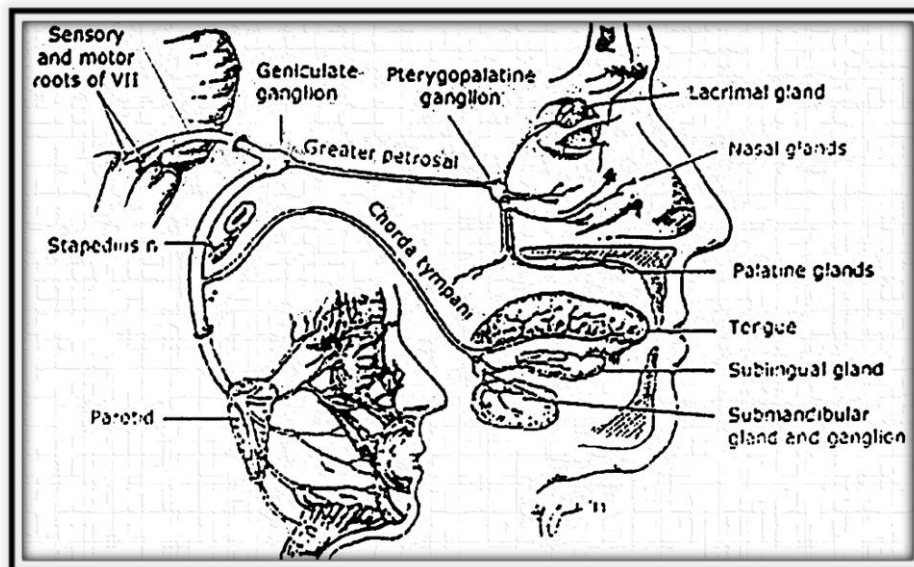
Cranial nerve	function	Cranial nerves examination
I - olfactory	smell	Pt. closes eyes, test one nostril at time, use 3 common smells, avoid irritating smell.
II - optic	Vision	•Visual acuity :- with Snellen chart or Counting method •Visual fields by confrontation test. •Color vision. •Pupillary reaction to light.
III, IV, VI: oculomotor, trochlear, abducent	Eye movement	•Inspect eyelids for ptosis. •Inspect pupils' size for direct & consensual response to light. •Test extra-ocular movements.
V - trigeminal	Sensory of face	•Inspect face for muscle atrophy. •Palpate jaw muscles for tone and strength when PT clenches teeth (masseter, temporalis) muscles. •Test superficial pain and touch sensation in each branch •Test corneal reflex
VII - facial	Motor of face	•Inspect symmetry of facial features various expressions (smile, frown, puffed cheeks wrinkled forehead, purse lips and blow out, show teeth, squeeze eyes shut) •Look at the external ear and examine the parotids. Test for salt, and sweat taste.(see page 10)
VIII -vestibule-cochlear	Balance & hearing	•Test sense of hearing with Weber tests Compare bone and air conduction of sound Test for lateralization of sound
IX - glossopharyngeal	Gag reflex Taste post 1/3	•ability to identify sour and bitter tastes •gag reflex and ability to swallow
X - vagus	Gag reflex Uvula (soft palate)	•Inspect palate and uvula for symmetry with PT say (AAA) • gag reflex Observe for swallowing difficulty.
XI - accessory	Motor sternomastoid & trapezius	• trapezius muscle strength (shrug shoulders). •SCM strength (turn head to each side)
XII - hypoglossal	Motor of tongue	Inspect tongue in mouth and while protruded for symmetry, tremors, and atrophy

N.B:-- Deviation of mandible (**V**) and tongue (**XII**) to same side of lesion.

- Deviation of mouth (**VII**) and uvula(**X**) to intact side (opposite side of lesion).

Course of facial nerve

The nucleus lies in the pons⇒ the nerve leaves from the lateral surface of the pons⇒ Cerebellopontine angle relay in the geniculate ganglia [which sends sup. Petrosal N] then enters the internal auditory meatus⇒ through the facial canal [in canal gives Nerve to stapedius and Chorda tympani] leaves the skull by emerging from stylomastoid foramen enters parotid gland and branches to supply the face
Localization of the abnormality is based on the neuroanatomy



Clinical Features	Site
6 th and 7 th cranial nerves palsies	Pons(hemorrhage).
5 th , 7 ^h , 8 th + cerebellar signs	Cerebellopontine angle tumor (medaloblastoma, acoustic neuroma)
Vesicles on ear of affected side	geniculate ganglia (H.Z)
Lacrimation involved	Lesion before int. audit, meatus
Hyperacusis (intolerance to loud sound) or loss of Taste	Lesion in the facial canal (O.M)
No Hyperacusis or loss of Taste	Lesion at the stylomastoid foramen or in the parotid gland

What are the branches of the facial nerve?

1. Greater superficial Petrosal nerve (supplies lacrimal glands).
2. Nerve to stapedius muscle.
3. Chorda tympani (supplies taste to anterior two thirds of tongue)
4. Motor branches ⇒ (temporal, zygomatic, buccal, mandibular, cervical).

✱ Facial nerve examination

• Inspection

- 1-Comment of the symmetry
- 2-Wrinkles over the forehead
- 3-Wide of palpebral fissure
- 4-Flattening of the naso-labial fold
- 5-Depression of the mouth angle (in affected side)
- 6-Deviation of the angle of the mouth (in normal side)

• Ask pt. to do the following movement:-

Test	Muscle	Nerve supply
Raising of eye brows	Frontalis	Temporal branch
Drawing eyelids downward (frown)	Curragator	Temporal branch
Closure of the eye and don't let me open them	Orbicularis oculi	Temporal and zygomatic
Smile (Show me your teeth)	zygomaticus major	zygomatic nerve
Elevation of the lip angle	Levator anguli oris	Buccal branch
Closure of mouth and lip purse and Whistle	Orbicularis oris	buccal and Mandibular branch
Blow your cheeks and don't allow air escape.	Buccinators	Buccal branch

✱ Tell examiner ⇒ I would like to do the following:-

- Look for external auditory meatus ⇒ vesicles
- Intolerance to high pitched sounds ⇒ Hyperacusis [Paralysis of stapedius m.s] ⇒ help us in localization.
- Examine ear by otoscope ⇒ congested drum (O.M)
- Test for Corneal reflex
- Palpate the parotid gland ⇒ parotid tumor
- Test for Taste in the Ant 2/3 of tongue (chorda tympani) ⇒ help us in localization.

✱ Then tell examiner I would like to ask PT for:-

- History of URTI is important ⇒ Bell's palsy which is known to occur after URTI.
- History of DM
- History of trauma or neurosurgery.
- Chronic headache, blurred vision , projectile vomiting ⇒ intracranial tumor.

Causes of upper facial nerve palsy

- 1-Tumors.
- 2-Trauma.
- 3-infection ⇒ Brain Abscess.
- 4- Stroke ⇒ vascular.
- 5- MS.

Causes of unilateral lower facial nerve palsy

1. Bell's palsy is the most
2. Diabetes
3. Ramsay-Hunt syndrome:
4. Pontine hemorrhage
5. Cerebellopontine angle tumor
6. OM
7. Parotid tumor

N.B:- Ramsay-Hunt syndrome is caused by herpes zoster infection of geniculate ganglion; distinguished from Bell's palsy by a vesicular eruption in pharynx and external auditory canal, and by frequent involvement of eighth cranial nerve.

Causes of bilateral lower facial nerve palsy

1. Fisherman syndrome (part of GBS)
2. Heerfordt's syndrome (part of Sarcoidosis)
3. Diabetes
4. Leprosy
5. Lyme disease

N.B:-Differences between UMNL (pseudo-bulbar) and LMNL (bulbar) in facial nerve palsy⇒ **Forehead & eyes are spared in UMNL.**